REMARKS/ARGUMENTS

Reconsideration of the application as amended is respectfully requested.

Status of Claims

Claims 1 and 3-19 are pending in the application, with claims 1 and 16-19 being the only independent claims. Claims 3 and 7 have been amended.

Overview of the Office Action

Claim 7 stands rejected under 35 U.S.C. 112, second paragraph, because of an alleged informality therein.

Claims 1, 3-11, 14 and 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,550,247 (*Evans*) in view of JP 03-027175 (*JP '175*).

Claim 12 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175*, and further in view of DE 35 39 318 (*DE '318*).

Claim 13 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175*, and further in view of DE 27 22 304 (*DE '304*).

Claim 16 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175*.

Claim 17 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175* and *DE '318*.

Claim 18 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175* and *DE '304*.

Claim 19 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Evans* in view of *JP '175*.

Amendments Addressing Informalities

Claim 7 has been amended to address the informality identified in the Office Action.

In view of the self-explanatory amendment, withdrawal of the rejection under 35 U.S.C. 112, second paragraph, of claim 7 is respectfully requested.

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses a method of applying a metal coating to graphite. An embodiment of the method includes the steps of anodic etching the graphite in an alkaline etchant, Pd seeding the graphite, and electroplating the graphite with a metal to form the metal coating on the graphite. *See* paragraphs [0007], [0008] and [0012] of the specification.

The anodic etching cleanses and slightly etches the graphite surface. In other words, after the anodic etching, the graphite surface is not only essentially free of foreign impurities, but also slightly roughened. As a result, the metal coating can effectively interlock with the graphite surface, and accordingly has a high adhesive strength and temperature stability. *See* paragraph [0007] of the specification.

The alkaline etchant preferably is a solution of at least one of NaOH and KOH having a concentration in the range of 10 to 70% by weight. *See* paragraph [0016] of the specification.

The duration of the anodic etching is preferably in the range of 5 to 90 minutes. *See* paragraph [0015] of the specification.

Descriptive Summary of the Prior Art

Evans

Evans relates to a method of producing a metal composite (*see* Abstract of *Evans*). More particularly, the goal of *Evans* is to use carbon filaments to reinforce metals thereby forming a metal composite. However, carbon filaments are not normally wetted by molten metals. To overcome this difficulty, *Evans* proposes a two-step approach. First, a metal coating is formed on carbon filaments by electrodeposition, electroless plating or chemical plating. Then, the metal coated carbon filaments are made into a metal matrix by a process such as electroforming or hot pressing. *See* the Abstract; col. 1, lines 28-45; col. 2, lines 45-54 of *Evans*.

Evans teaches that subjecting the carbon filaments to an oxidizing treatment (with nitric acid or chromic acid as the oxidizing agent) before they are coated with the required metal will improve the metal coating results. *See* col. 2, lines 11-29 of *Evans*.

Evans also describes how the carbon filaments are made. According to *Evans*, a carbon filament "may be produced by subjecting a filament having a carbon to carbon backbone to a series of heat treatments designed to reduce the filament essentially to that carbon backbone" (*see* col. 1, lines 49-64 of *Evans*). In other words, the heat treatments define the strength and high orientation properties of the carbon filaments.

The carbon filaments made by such heat processes are called graphitized filaments, which are especially suitable for use in the process of *Evans*' invention (*see* col. 2, lines 7-10 of *Evans*).

JP '175

JP '175 relates to a method of making carbon fiber from a polyacrylonitride-based or pitch-based substance. *See* the Abstract of *JP '175*. The method includes the step of anodic etching a carbonized fiber in an aqueous solution of an electrolyte. After this step, the fiber is calcined in an inert atmosphere to remove low oriented parts so that the carbon fiber has high orientation properties and excellent tensile strength. *See* the Abstract of *JP '175*.

Allowability of the Claims

Independent Claim 1

On page 7 of the Office Action, the Examiner acknowledges one difference between *Evans* and claim 1--*Evans* does not disclose anodic etching, as expressly recited in claim 1 of the present application.

Applicant respectfully submits that there are two more differences between *Evans* and claim 1. In particular, as discussed in detail below, *Evans* does not teach or suggest using graphite because the graphitized filaments used in *Evans* are different from graphite. Moreover, *Evans* does not teach or suggest etching the graphitized filaments in an alkaline etchant because *Evans* explicitly teaches using nitride acid or chromic acid as an oxidizing agent to oxidize the graphitized filaments (*see* col. 2, lines 15 and 16 of *Evans*).

To bridge these "gaps" between *Evans* and claim 1, the Examiner essentially modifies *Evans* by replacing the oxidizing of *Evans* with the anodic etching of *JP '175* and by interpreting the graphitized filaments of *Evans* as graphite.

Applicant respectfully submits that claim 1 is patentable over *Evans* in view of *JP '175* for reasons including the following:

(A) *JP '175* cannot be used to modify *Evans* because *JP '175* is nonanalogous prior art;

(B) even if *JP '175* were analogous prior art, there is no suggestion or motivation to modify *Evans* with *JP '175* by replacing the oxidizing of *Evans* with the anodic etching of *JP '175*; and

(C) even if there were a suggestion or motivation to modify *Evans* with *JP '175*, the resulting combination fails to teach or suggest all of the limitations of claim 1 of the present application.

(A) JP '175 is nonanalogous prior art

As discussed earlier, *JP '175* relates to a carbon fiber making method, in which after an anodic etching treatment, the carbonized fiber is calcined in an inert atmosphere to remove low oriented parts so that the carbon fiber has high orientation properties and excellent tensile strength. No metal coating or electroplating is contemplated in *JP '175*. It logically follows that *JP '175* does not address the issues of adhesive strength and low temperature stability of a metal coating on the resulting carbon fiber.

In sharp contrast, the claimed invention relates to method of applying a metal coating to graphite by electroplating. The goal is to substantially improve the adhesion between the metal coating and the graphite. Since the carbon fiber making of *JP '175* is neither in the field of applicant's endeavor (applying a metal coating to graphite) nor reasonably pertinent to the particular problem (low adhesive strength and low temperature stability of the metal coating)

with which the inventor was concerned[1], applicant respectfully submits that *JP '175* is nonanalogous prior art, and that as a result *JP '175* cannot be used to modify *Evans*.

If the Examiner is still of a contrary view, then she is respectfully requested to provide a thorough explanation as a basis for such view in full compliance with PTO requirements on this issue.

(B) Even if JP '175 were analogous prior art, there is no suggestion or motivation to replace the oxidizing of Evans with the anodic etching of JP '175

As explained in detail below, even if *JP* '175 were analogous prior art, there is no suggestion or motivation to modify *Evans* by replacing the oxidizing of *Evans* with the anodic etching of *JP '175*.

As discussed earlier, *Evans* relates to a method of producing a metal composite (*see* the Abstract of *Evans*). The goal of *Evans* is to use carbon filaments to reinforce metals thereby forming a metal composite. Since carbon filaments are not normally wetted by molten metals, *Evans* proposes a two-step approach to overcome this difficult. First, a metal coating is formed on carbon filaments by electrodeposition, electroless plating or chemical plating. Then, the metal coated carbon filaments are made into a metal matrix by a process such as electroforming or hot pressing. *See* the Abstract; col. 1, lines 28-45; col. 2, lines 45-54 of *Evans*.

Evans also mentions how the carbon filaments are made. According to *Evans*, a carbon filament "may be produced by subjecting a filament having a carbon to carbon backbone to a series of heat treatments designed to reduce the filament essentially to that carbon backbone"

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[1] Applicant notes that the carbon fiber making of *JP '175* is similarly not in the field of *Evans*' endeavor (combing a metal with carbon filaments to form a metal composite) nor reasonably pertinent to the particular problem (the bonding between the metal coating and the carbon filaments) with which *Evans* was concerned.

(*see* col. 1, lines 49-52 of *Evans*). Thus, in *Evans*, the heat treatments define the strength and high orientation properties of the carbon filaments.

Evans teaches that subjecting the carbon filaments to an oxidizing treatment (with nitric acid or chromic acid as the oxidizing agent) before they are coated with the required metal will improve the metal coating results. *See* col. 2, lines 11-17 of *Evans*. The oxidizing treatment, which is conducted after the heat treatments (i.e., after the carbon filaments are made), does not define the strength and high orientation properties of the carbon filaments.

JP '175 relates to a carbon fiber making method, in which after an anodic etching treatment, the carbonized fiber is calcined in an inert atmosphere to remove low oriented parts so that the carbon fiber has high orientation properties and excellent tensile strength. According to the Examiner, in *JP '175*, the anodic etching is used to improve the high orientation properties and tensile strength of the resulting carbon fibers.

No metal coating or electroplating is contemplated in *JP '175*.

Thus, the oxidizing of *Evans* is conducted, in an acid solution, after the carbon filaments are made (i.e., after the heat treatments) and for the purpose of improving the metal coating results. The oxidizing and the subsequent metal coating are not used to improve the strength of the carbon filaments or the resulting metal composite because *Evans* uses the carbon filaments to reinforce the metal.

In sharp contrast, the anodic etching of *JP '175* is conducted, in an alkaline solution, before the carbon fiber is made (i.e., before the heat treatment) and for the purposes of improving the high orientation properties and tensile strength of the resulting carbon fiber. No metal coating or electroplating is contemplated in *JP* '175.

In view of these fundamental differences between *Evans* and *JP '175*, a person with ordinary skill in the art would not be motivated to replace the oxidizing of *Evans* with the anodic etching of *JP '175* for the purposes of improving the strength[2] of the metal composite.

The fact that something can be done is an insufficient basis to obviate an invention. Absent a motivation, the references can be modified and/or combined in the way proposed in the Office Action only with impermissible hindsight based on the present claimed invention.

(C) Even if there were a suggestion or motivation to modify Evans with JP '175, the resulting combination fails to teach or suggest all of the limitations of claim 1

As explained in detail below, even if there were a suggestion or motivation to modify *Evans* with *JP '175*, the resulting combination fails to teach or suggest all of the limitations of claim 1 of the present application.

In particular, the resulting combination fails to teach or suggest (1) graphite as the subject to be electroplated, or (2) using both a Pd seeding step and an electroplating step, as recited in claim 1.

(1)

Evans uses the expression "graphitized filaments" to refer to the carbon filaments which are made by heat treatments. As explained in the Response dated May 22, 2006, this expression "graphitized" is not a precise expression. This expression does not refer to graphite. Rather, it refers to the process in which a filament having a carbon to carbon backbone is subjected to a

[2] In the Office Action, the Examiner also contends that the electroplating of *Evans* improves the parallel formation of the carbon filaments in the metal composite. However, parallel formation of the carbon filaments and high orientation properties of the carbon filaments are two different things. The parallel formation of the carbon filaments in the metal composite has nothing to do with the high orientation properties of the carbon filaments. As discussed earlier, in *JP 175*, the heat treatment defines the high orientation properties of the resulting carbon fiber. Similarly, in *Evans*, the heat treatments define the high orientation properties of the resulting carbon filaments. The metal coating of *Evans* does not define or alter the high orientation properties of the carbon filaments.

series of heat treatments so that the filament is essentially reduced to that carbon backbone (*see* col. 1, lines 49-64 of *Evans*). However, such heat treatments do not turn the carbon filaments of *Evans* into graphite.

Carbon filaments/fibers and graphite are two different materials. Carbon filaments/fibers are man-made. In contrast, graphite occurs in nature. Carbon filaments/fibers are special modifications in the form of very thin filaments/fibers of a diameter of some micron. In contrast, graphite is a two-dimensionally crystalline modification of carbon and a bulk material. Carbon filaments/fibers have an enormous tensile strength. Therefore, carbon filaments/fibers are usually used in high-performance vehicles, sporting equipment, and other demanding mechanical applications (that is why *Evans* teaches using the carbone filaments to reinforce metals). In sharp contrast, graphite is one of the softest materials on earth, and therefore is often used as a lubricant (if the Examiner's interpretation were correct, then *Evans* teaches using graphite to reinforce metals, which is technically impossibe).

For these reasons discussed above, applicant respectfully submits that the graphitized filaments of *Evans* are not graphite, and *Evans* does not teach or suggest using graphite, as recited in claim 1.

JP '175 does not supply what is missing from *Evans*. *JP '175* mentions "graphitized yarn" (*see* the Abstract of *JP '175*). But as explained in the Response dated May 22, 2006, in *JP '175*, what is meant by the expression "graphitized yarn" is that carbon fibers are usually made by first producing synthetic fibers (melt spinning), and then by "carbonizing" the synthetic fibers (i.e., by expelling hydrogen and oxygen so that only carbon is left). Therefore, the graphitized fibers/yeans of *JP '175* are not graphite either.

As a result, the combination of *Evans* and *JP '175* fails to teach or suggest graphite, as recited in claim 1.

(2)

Evans also does not teach or suggest using both Pd seeding and electroplating, as recited in claim 1. *Evans* teaches that the metal coating is formed on the carbon filaments by electrodeposition, electroless plating or chemical plating (*see* col. 1, lines 38-41 of *Evans*). In other words, *Evans* teaches using only one of electroplating, electroless plating and chemical plating to form a metal coating on the carbon filaments. *Evans* does not teach using both electroplating and electroless plating.

Evans further teaches that among electroless plating processes, the electroless nickel process is the one which has been most used. *Evans* then teaches that the electroless nickel process can be used in his inventive process if the carbon filaments, which are not a catalyst to the reaction, are first sensitized by, for example, forming a thin Pd coating on the carbon filaments. *See* col. 3, line 68 to col. 4, line 17 of *Evans*.

In other words, *Evans* teaches using the Pd seeding step only when the electroless nickel process is chosen to form a nickel coating on the carbon filaments. *Evans* does not teach or suggest using the Pd seeding step when the electroplating process is chosen. Therefore, contrary to the Examiner's interpretation, *Evans* does not teach or suggest using both a Pd seeding step and an electroplating step, as expressly recited in claim 1.

Obviously, *JP '175* does not supply what is missing from *Evans* in this regard because no metal coating is contemplated in *JP '175*.

As a result, the combination of *Evans* and *JP '175* also fails to teach or suggest using both Pd seeding and electroplating, as recited in claim 1.

In view of the above-discussed reasons (A), (B) and (C), applicant respectfully submits that claim 1 is patentable over *Evans* in view of *JP '175*.

Dependent Claims 3-15

Claims 3-15 depend, either directly or indirectly, from independent claim 1 and, thus, each is allowable therewith.

In addition, these claims include features which serve to even more clearly distinguish the present invention over the prior art of record.

In particular, as discussed earlier, *Evans* does not teach or suggest using both a Pd seeding step and an electroplating step. Rather, Evans teaches using a Pd seeding step only when the electroless nickel process is chosen. Therefore, it logically follows that *Evans* does not teach or suggest an electroless plating step between a Pd seeding step and an electroplating step, as recited in claim 3.

Moreover, it is respectfully submitted that the Examiner has not made a *prima facie* case of obviousness against claims 9 and 14.

In order to establish a *prima facie* case with respect to a claimed range, an Examiner is required to first find a prior art range which is either within or at least very close to the claimed range. In other words, finding a prior art range which is either within or at least very close to the claimed range is the prerequisite for establishing a *prima facie* case of obviousness. Only after an Examiner has established a *prima facie* case by finding a prior art range which is either within or at least very close to the claimed range, then the burden is shifted to the applicant to prove that

the claimed range is critical or achieves unexpected results relative to the prior art range. *See* MPEP 2144.05(I), (II) and (III).

In the Office Action, with respect to the current duration range recited in claim 9, the Examiner merely states that the electroplating of *Evans* inherently has a current duration without even pointing out a specific range. Similarly, with respect to the applied electrical potential range recited in claim 14, the Examiner merely states that the anodic etching of *JP '175* inherently has an electrical potential without even pointing out a specific range. Thus, the Examiner does not even specify a prior art value, let alone specify a prior art range which is either within or at least very close to the claimed range.

It is noted that the Examiner withdrew her previous rejections of claims 16 and 19 in view of applicant's January 17, 2006 argument that the claimed range neither overlaps or lies inside the prior art range, nor is close enough to the prior art range. Applicant does not see how the current 35 U.S.C. 103 rejection of claims 9 and 14 can be sustained when the Examiner does not even specify a prior art value or range.

The Examiner contends that each of the claimed current duration range of 5 to 90 minutes (claim 9) and the claimed applied electrical potential range of 4V to 20V (claim 14) is a mere optimization. However, there are countless current duration ranges or applied electrical potential ranges available. The Examiner fails to explain why a person with ordinary skill in the art, when facing these countless ranges, would optimize the respective ranges to those recited in claims 9 and 14.

Moreover, if an Examiner were legally permitted to reject a claimed range based on the theory of optimization without even specifying a prior art range which is either within or at least

very close to the claimed range, then the requirements specified in MPEP 2144.05(I), (II) and (III) would become meaningless.

Independent Claims 16-19

Each of independent claims 16-19 recites the step of anodic etching graphite in an alkaline etchant. Therefore, each of claims 16-19 is patentable for reasons (A), (B) and (C)(1) discussed above in connection with claim 1.

In addition, claim 19 is also patentable for reasons discussed above in connection with claims 9 and 14.

Prior art relied on by the Examiner

The remaining references applied by the Examiner against the claims have been reviewed, namely DE '304 and DE '318. It has been found that these references, when applied singly or in combination with any of the other cited references, do not adversely affect the patentability of the present invention because they fail to bridge the above-discussed gap between the present invention and the primary reference.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

Respectfully submitted,

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Dated: December 11, 2006